BioChemistry

  -     organic chemistry ? the chemistry of carbon found in living things -   of all of the molecules in living things, 50-95% is water (hydrogen & oxygen), less than 1% are ions, almost all of the rest of the molecules in living things are organic -   the three most common elements of life are carbon, hydrogen and oxygen ? which are found in all four of the most common organic molecules carbohydrates (composed of sugars), lipids (fats and waxes), proteins (composed of amino acids) and nucleic acids (composed of nucleotides) -   other elements found bonded in organic molecules are sulfur, nitrogen, phosphorus   Nutrition -   there are three classes of molecules/atoms/ions that are required for life: 1.   macronutrients -   are required in large amounts -   used for energy and building blocks of molecules necessary for life -   include carbohydrates, lipids, and proteins 2.   micronutrients -   required in small amounts -   used in chemical reactions -   includes vitamins and minerals 3.   special -   water ? dissolves molecules, is involved in transport, acts as a cushion, flushes out waste, helps maintain body temperature -   fibre ? from fruits, vegetables and whole grains ? undigestable cellulose, provides bulk in the digestive system, and may help prevent obesity, colon cancer, heart disease, gallstones, irritable bowel syndrome, diverticulitis and diabetic conditions   Water -   most abundant molecule of life, making up 50-95% of the weight of living systems -   covalently bonded atoms of hydrogen and oxygen -   polar molecule ? charge separation (d+, d-) -   H O H d+ d- molecules are held together with fairly strong intermolecular forces called hydrogen bonds -   hydrogen bonds are found in many organic compounds where either nitrogen or oxygen are bonded to hydrogen -   hydrogen bonding leads to extraordinary physical properties   Physical Properties of Water (due to its small size, polarity and H-bonds)   1.   Cohesion: Water molecules tend to stick to one another. This is important in the transport of water against gravity, and keeping water inside cells even though there are openings. 2.   Surface tension. Surface tension = measure of difficulty in breaking the surface of a liquid. Higher surface tension than most liquids. Animals can walk on the surface, live on it, live under it, get trapped under it. 3.   Adhesion. Water molecules tend to stick to other molecules. This means that water makes things wet. Water is an excellent solvent for both ionic and polar compounds. NaCl dissociates into Na+ and Cl- ions. This allows substances to circulate within animals. Fats and other nonpolar molecules, however do not readily dissolve in water 4.   Water has a high specific heat (amount of heat that must be absorbed or lost to change the temperature of a substance) Because of high specific heat, organisms can be buffered against temp change. Also, water habitats change temp slowly, oceans tend to be stable habitats, and land near water has milder climates. 5.   Water has a high heat of vaporization (quantity of heat a liquid must absorb in order to be converted to a gas). Makes evaporative cooling an effective mechanism of heat loss.   Water also has a high heat of solidification (quantity of heat that must be lost as water freezes). As water freezes, it will release energy, warming the environment around it. 6.   Water reaches maximum density at 4?C. Ice floats, and water expands as it solidifies due to the open crystal made as more hydrogen bonds are formed. Because of this, bodies of water freeze from the top down, and don't freeze solid.   This allows organisms living in the water to have access to the bottom ? where the food is ? all winter long, and helps insulate the water, maintaining the temperature above or at worst near freezing. As well, if ice were more dense, it would sink and be insulated from the summer sun, tending not to melt.   Organic Molecules (chapter 3) -   organic molecules all contain carbon, which form 4 strong covalent bonds each ? with other elements or with other carbon atoms ? which allows for a wide variety of bonding configurations -   the shape of an organic molecule largely determines its properties and function in living systems -   there are five major groups of organic compounds found in cells ? carbohydrates, lipids, proteins, nucleic acids, and vitamins   Carbohydrates -   organic compounds that are composed of carbon, oxygen and hydrogen in the ratio of 1:2:1 (CH2O) -   includes sugars and starches, fibres and wood. -   in the diet, carbohydrates provide 17kJ/g consumed (or 4 Calories/g) -   Most abundant organic compounds in nature, serve as immediate energy sources, energy reserves to fuel life processes, as structural compounds, and as building blocks for other molecules -   generally soluble in water, due to the OH (polar nature) of the sugars -   carbohydrates are formed from small sugar molecules, and the carbohydrates formed are classified based on the sugars they contain -   monosaccharides are the simplest carbohydrates and they are made up of carbon atoms to which H and O atoms are attached -   can contain from 3 carbons (triose) to 7 carbons (heptose) (sugar names end in ose) -   e.g. glucose C6H12O6. Alpha Glucose is the form in which sugar is transported through animal systems. They may exist in open (chain) or ring form, with ring forms the most common (since they are more stable in solution). Monosaccharides are called monomers ? which can be linked together to form larger carbohydrates -   glucose and fructose are isomers of C6H12O6, the difference is where the oxygen and hydrogen atoms are attached a - D - glucose

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About the Author

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